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Parallel Processing in the GDMS Analysis Pipeline

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OVERVIEW

General Dynamics Mission Systems (GDMS) operates, maintains, upgrades, sustains, and recapitalizes the installed U.S. Radionuclide Particulate and Noble Gas systems and station infrastructure in support of the CTBTO International Monitoring System. GDMS also acts as station operator for the radionuclide station at Diego Garcia (RN66) and supports the CTBTO with data monitoring of ten additional Non-US Radionuclide Aerosol Sampler/Analyzer (RASA) systems; 21 stations in total.

GDMS receives a variety of data files from the radionuclide stations. Through International Data Center (IDC) and National Data Center (NDC) coordination, GDMS receives, processes and analyzes data through to a single 'Pipeline' server at the GDMS Sensor Operations Center (SOC). The Pipeline server's ability to process these files quickly and accurately remains critical to allow GDMS to meet program, contract and customer requirements.

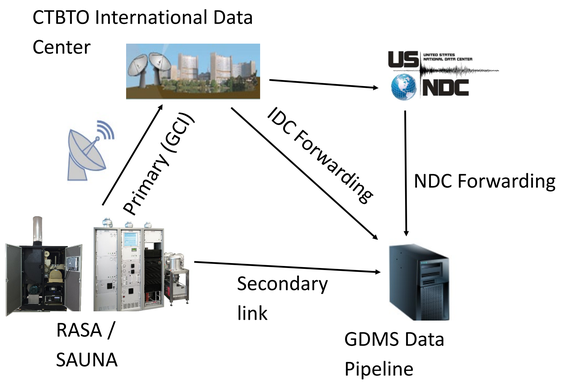
The ultimate goal: continue to improve RN Station Data Availability.

PROBLEM

The Pipeline server has been overwhelmed at times with the sheer number of files it receives, resulting in delays and skipped processing of files. It has also been plagued with reliability issues, and requires constant attention to remain operational.

DATA FLOW

- Pipeline processes PHD, SOH, MET, ALERT, ARR and RRR data products from RASA and Swedish Automatic Unit for Noble Gas Acquisition (SAUNA) Systems
- Data input from up to three separate links: a primary link from the USNDC, a secondary link direct from the RASA, and via the CTBTO IDC



CURRENT ARCHITECTURE

Centralized architecture

- Pipeline analysis code and Oracle database reside on same server.

Difficult to maintain

- Legacy software running on Solaris is difficult to keep running

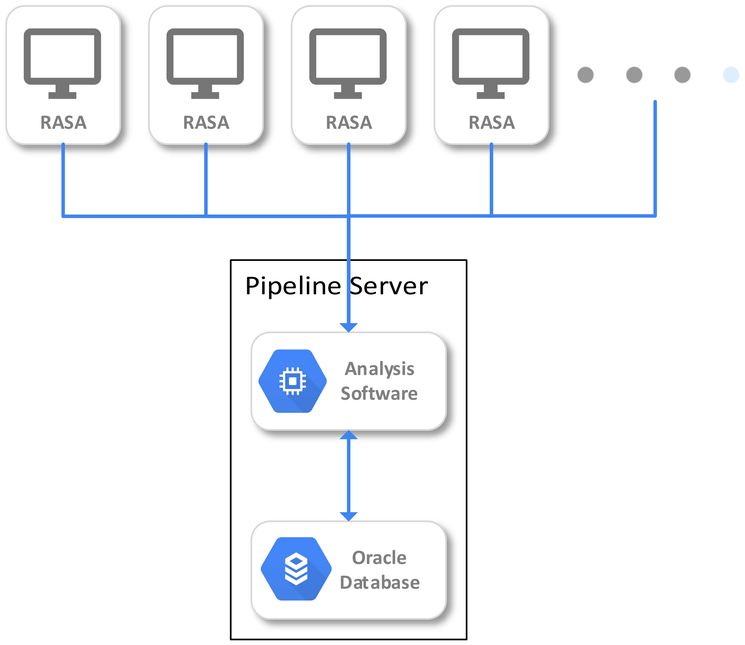
Slow Response

- Unable to process all incoming data files in a timely manner and skips low priority files as a result

Unreliable

- Has suffered from downtime and been plagued with memory issues
- Hardware and software obsolescence make restoration difficult and expensive

CURRENT ARCHITECTURE DIAGRAM



FUTURE ARCHITECTURE

Decentralized architecture

- Parallel processing system resides on different load-balanced nodes
- Upgraded database resides in GDMS cloud network
- Slack service integrated into new architecture
  to send real-time alerts to team members
  mobile devices of RASA faults.

Improved Maintainability

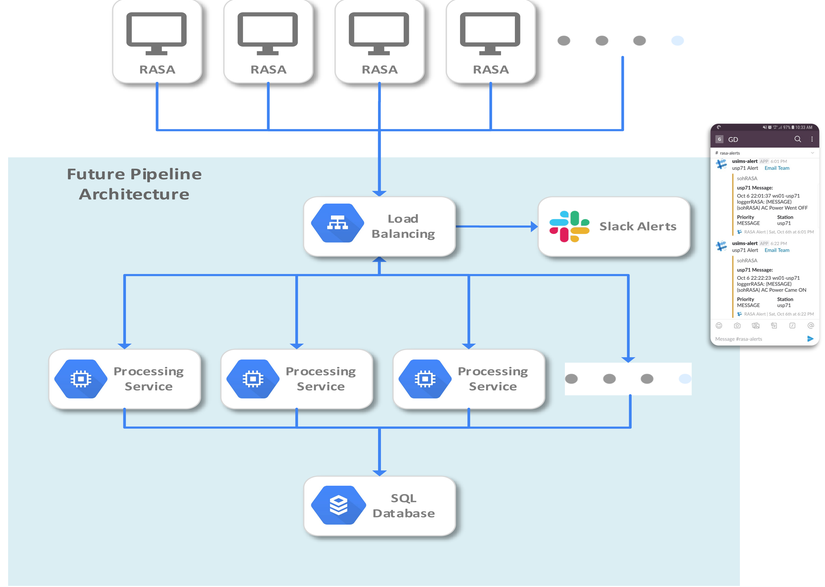
- Updated code and libraries will run on Linux-based OS

Quicker Responsiveness

- Data will be processed according to priority level
- New services can be created as demand requires

Increased Reliability

- Multiple redundancies to reduce system downtime



CONCLUSIONS

- Slack service already implemented leading to quicker resolutions of RASA faults and ultimately improving US IMS RN Station Data Availability
- Remaining architecture components slated for completion in 2019
- Updated pipeline code and libraries expected completion in 2020

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Disclaimer: The views expressed on this poster are those of the author and do not necessarily reflect the view of the CTBTO